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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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TECHNICAL REPORT

ON

KNITTING-MACHINE OPERATOR (knit goods) 4-14.061

~~B-616~~
S-336

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U. S. Employment Service
in Cooperation with
Pennsylvania State Employment Service

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

KNITTING-MACHINE OPERATOR

B-616

Summary

The General Aptitude Test Battery, B-1002B, was administered to a final sample of 53 individuals employed as Knitting-Machine Operators 4-14.061 at knitting mills in Philadelphia, Pennsylvania. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G- Intelligence, S-Spatial Aptitude and F-Finger Dexterity were selected for inclusion in the final test norms.

GATB Norms for Knitting-Machine Operator 4-14.061, B-616

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1- H CB-1- I CB-1- J	80	G	Part 3 Part 4 Part 6	75
S	CB-1- F CB-1- H	80	S	Part 3	75
F	CB-1- O CB-1- P	95	F	Part 11 Part 12	90

Effectiveness of Norms

The data in Table IV indicate that only 64 percent of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 90 percent would have been good workers. 36 percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 10 percent would have been poor workers.

TECHNICAL REPORT

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Knitting-Machine Operator 4-14.061.

II. Sample

The GATB, B1002B, was administered during the period November 1963 through March 1964 to a final sample of 53 individuals (52 men and 1 woman) employed as Knitting-Machine Operators 4-14.061 at the following Knitting Mills in Philadelphia, Pennsylvania: Tartan Knitting Mills, Robert Bruce Inc., Soowal Knitting Mills, Clearfield Mills, Bergman's Knitting Mills, Na-Lor Company, and Clover Mills.

No tests were used in the selection of workers for employment. Applicants are interviewed by a foreman of the company. Completion of high school education is preferred. The on-the-job training period is three months. However, it usually takes six months to attain full productive capacity. Workers receive general supervision from the foreman or the head mechanic.

TABLE I

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

N = 53	M	σ	Range	r
Age (years)	34.5	12.3	19-58	-.066
Education (years)	10.4	1.3	8-13	.165
Experience (months)	49.2	55.9	4-240	.252

III. Job Description

Job Title: Knitting-Machine Operator 4-14.061

Job Summary: Operates designated number of knitting machines: Generally operates three or four circular machines which run more slowly. May team with one other knitter to run three rapidly operating machines.

Makes sure machine is operational before beginning and checks constantly during the day: Makes sure all stop-motion devices are in working order; tests by activating devices. Cleans lint, dirt, and oil from vital points of stop-motion system by wiping with rag. At least once during the day checks stop motions on machine to see that they are in working order.

Work Performed: Determines production requirements for day and makes sure they are met: Checks knitting ticket on each machine to see the kind of work to be produced on that machine for the day. Determines from ticket the amount to be knitted; the style, size, part, dimensions, yarn type, color and kettle number (dye lot number). May set meter at beginning of each bundle so that meter stops machine automatically at end of bundle. May detach earning stub from work ticket and turn into the Payroll Department at end of the day. May record meter figures from previous day on tally card and change meter lever to his shift. Checks set-up ticket to determine number of links in set-up mechanism. Changes number of links as required to knit different length pieces--removes link by lifting with fingers and disengaging from link above and below it, or adds link by disengaging two links and inserting new ones between. As order or bundle is completed, takes it from roll, either by pulling separator threads or by cutting with scissors; ties bundle, signs ticket that order is complete and attaches to bundle; carries completed bundles to designated area. May post production records. Records on sheet anything unusual that happens such as machine breakdown, etc.

Checks for quality of work being produced: Visually checks fabric as it comes from machine, looking for any defects such as vertical lines, horizontal lines, missed stitches, etc. When defect is spotted, stops machine and determines the cause of the defect--vertical line may result from bent needle, horizontal line may result from wrong yarn or defective yarn; attempts to make correction but calls mechanic if unable to determine cause or to make correction. Takes test strip of fabric being knitted and brings it to the next department for processing; receives piece after processing with direction for any corrections to machine that might be necessary. Checks number of stitches in fabric being knitted on each machine at least once a day to make sure that number of stitches per inch is the same as that established by management; records findings and initials them. If number of stitiches knitted per inch is not correct, stops machine and notifies foreman or head mechanic.

Makes changes, adjustments or repairs to machine within his capacity: Replenishes yarn as it is consumed - stops machine just before yarn runs out; removes depleted cone and breaks yarn attached to cone with hands; checks for proper kettle number of yarn cone; places full cone on cone stand and ties end of yarn from cone to end of yarn in machine using, generally, knitter's or weaver's knot; breaks off any excess yarn with fingers or cuts off with scissors. May change color or colors by using same method as in replenishing yarn to replace cones. Ties up end when yarn breaks machine (usually stops automatically) - locates break in yarn; ties end of yarn in machine to end of yarn on cone; uses long stick with double-hook like attachment on end to lift yarn over stop-motion and through tension guides; may stand on ladder and thread by hand. Puts up end when yarn slips off tension guide or stop-motion by using long stick. Replaces damaged or broken needles and/or jacks (machine may stop automatically) - locates area of broken needle or jack: on automatic stop, needle deflector may indicate general area, may trace through position of defect in fabric, may turn machine slowly by hand, examining it visually, using a hand wheel at side of machine or a "jog button;" removes cam section or take-out block from side of machine using small wrench to remove bolt and taking section off with hand; removes defective needle or jack, using long needle to pull forward defective needle or needle parts, may pull out completely with long needles or grab with finger and pull out; replaces needle or jack by inserting in proper location with fingers; hooks fabric on to newly inserted needle using long needle, replaces cam section on take-out block and tightens bolt with wrench securing it to machines; turns machine by hand to make sure each new needle is taking yarn and releasing stitches properly; if needle is not functioning properly makes required adjustments or calls mechanic. Picks up press-off -- stops machine if not stopped automatically; determines reason for press-off such as stop-motion failure when yarn is exhausted, slub or knot on yarn preventing yarn from going through opening, striping miss, yarn cut out by faulty needle, malfunction in one of automatic operations or bad transfer; corrects yarn problems such as placing new cone if yarn is exhausted, cleaning yarn or retying knot if slub or knot appears on yarn, changing needles and retying thread if yarn is cut by faulty needle; after correcting yarn problem, threads yarn through tension guides and stop-motion devices and back through carrier using fingers and/or long needle, hooks fabric back on needles, turns machine carefully by hand or jogs it to knit press-off down through cylinder opening until fabric is clear; for other problems, may attempt correction or may call mechanic; checks to see that all fabric is back on needles--may open gates to keep needle from knitting if condition warrants, jogs machine to examine needles, closes gates, jogs machine to see that yarn from feeds forms stitches and that previously knitted cloth goes down, may push cloth with plunger or narrow instrument to help it go down. Calls mechanic in case of smash; may fix

own smash or help mechanic. May change pattern cards - generally stops machine; loosens screw holding coverplate with screwdriver; removes coverplate; removes counter weight; loosens thumb screw, pulls clutch releasing drum which holds card, takes out card; repeats procedure to remove remaining cards, working from right to left; places new card on drum that holds card, makes sure that designated "start" indicated on card is placed in correct positions on top of roll, thus setting the card "in time and on lap," when cards are numbered makes sure card is placed in proper sequence, each card numbered corresponding with position on machine; tightens thumb screw, places counter weight and replaces coverplate; replaces other cards in same manner working from right to left; sets machine in operation and examines first few pieces to ascertain that pattern is correct, by comparing with sample and/or checking symmetry.

Cleans and lubricates machine as required: Cleans with compressed air shortly before end of shift, blowing all lint and dirt from machine. Checks machine carefully (especially fingers and guides) for excess lint, lumps and twisted or tangled yarn. Makes sure everything is in order before starting power. Sweeps floor area around machines. Lubricates machine--uses hand-pump type oil can to drop required amount of oil in oil cups or holes at each part to be lubricated, oils parts daily or weekly using light or heavy oil as prescribed.

IV. Experimental Battery

All the tests of the GATB, B-1002B , were administered to the sample group.

V. Criterion

The criterion data collected consisted of two sets of independent ratings made by each worker's immediate supervisor on USES Form SP-21, "Descriptive Rating Scale." A period of at least two weeks elapsed between the first and second ratings. The rating scale consisted of nine items covering different aspects of job performance, with five alternatives for each item. Weights of one through five, indicating the degree of job proficiency attained, were assigned to the alternatives. A reliability coefficient of .86 was obtained for the criterion. Therefore, the two sets of ratings were combined, rustling in a distribution of final criterion scores of 28-87 with a mean of 62.4 and a standard deviation of 12.8.

VI Qualitative and Quantitative Analyses

A. Qualitative Analysis

On the basis of the job analysis data, the following aptitudes were rated "important" for success in this occupation:

Form Perception (P) - required to visually check fabric for defects, to locate causes of defects and to locate broken needles and jacks.

Motor Coordination (K) - required to coordinate eye and hand movements in changing needles, jacks, cones and links.

Finger Dexterity (F) - required to change needles, links and jacks and to thread needles and tie knots.

Manual Dexterity (M) - required to make adjustments and/or repairs to machines and to clean and lubricate machines.

On the basis of the job analysis data, V-Verbal Aptitude was rated "irrelevant" for success in this occupation.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 53

Aptitudes	M	σ	r
G-Intelligence	90.6	15.3	.400**
V-Verbal Aptitude	90.6	12.6	.325*
N-Numerical Aptitude	88.3	17.2	.219
S-Spatial Aptitude	96.8	18.9	.336*
P-Form Perception	93.6	18.9	.245
Q-Clerical Perception	97.7	14.7	.251
K-Motor Coordination	102.9	15.3	.208
F-Finger Dexterity	96.4	18.9	.250
M-Manual Dexterity	96.1	19.8	-.053

* Significant at the .05 level
** Significant at the .01 level

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important					X		X	X	X
Irrelevant		X							
Relatively High Mean				X		X	X	X	
Relatively Low Sigma		X				X			
Significant Correlation with Criterion	X	X		X					
Aptitudes to be Considered for Trial Norms	G			S		Q	K	F	

Trial norms consisting of various combinations of Aptitudes G,S,Q,K and F with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1002 norms consisting of G-75, S-75 and F-90 had the best selective efficiency.

VII. Validity of Norms

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 36 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes G, S and F with critical scores of 75, 75 and 90, respectively, and the dichotomized criterion for Knitting-Machine Operator 4-14.061. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for Knitting-Machine Operator 4-14.061
(G-75, S-75, F-90)

N = 53	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	26	34
Poor Workers	16	3	19
Total	24	29	53

Phi Coefficient = .585
χ^2 = 18.137
P/2 < .0005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes G, S and F with minimum scores of 75, 75 and 90, respectively, have been established as B-1002 norms for Knitting-Machine Operator 4-14.061. The equivalent B-1001 norms consist of G-80, S-80 and F-95

IX. Determination of Occupational Aptitude Pattern

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Guide to the Use of the General Aptitude Test Battery, January 1962. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.